CLAIMS

1. A movement facilitation device for facilitating movement between a first portion of a first object and a second portion of the first object, said device having:

(a) an actuator for moving the first portion with respect to the second portion, said actuator being coupled to the first portion of the first object; and

(b) an operating means coupled to the actuator for operating the actuator.

2. A movement facilitation device according to claim 1 wherein the first object is a joint having at least two members and wherein the actuator is coupled to at least one of said members.

3. A movement facilitation device according to claim 1, said movement facilitation device being applied to a joint chosen from the group consisting of all finger, thumb and hand joints, all toe and foot joints, wrist joints, elbow joints, shoulder joints, ankle joints, knee joints, hip joints, and any of the joints associated with the spinal column and skull, including the jaw.

4. A movement facilitation device according to claim 1 wherein the first object is a prosthesis of a joint selected from the group consisting of a human body joint and a joint of a non-human animal.

5. A movement facilitation device according to claim 1 wherein the actuator comprises a material which, when operated, contracts or decreases in length.

6. A movement facilitation device according to claim 1 wherein the actuator comprises a material which has a shape memory.

7. A movement facilitation device according to claim 1 wherein the actuator is capable of incremental actuation.

8. A movement facilitation device according to claim 7 wherein the actuator comprises a ratchet.

9. A movement facilitation device according claim 1 wherein the actuator is an electromechanical actuator of a type utilising a conducting polymer for effecting a desired action with change(s) in the volume of the polymer in response to an applied potential.

10. A movement facilitation device according claim 1 wherein the actuator is an electromechanical actuator comprising:

a conducting polymer, and

a conductor for conducting voltage along the polymer from one end region of the polymer to an opposite end region of the polymer,

wherein the conductor is arranged for extending and contracting in length with expansion and contraction of the polymer.

11. A movement facilitation device according to claim 9 wherein the conducting polymer is selected from the group consisting of polyaniline, polypyrrole, polythiophene, derivatives thereof and mixtures thereof.

12. A movement facilitation device according to claim 1 wherein the operating means comprises:

a power source having an on/off switch; and

at least one actuator interface linking the power source to the actuator, wherein when the power source is switched off, no power passes through the actuator interface and there is no change in electrical potential across the actuator, and wherein when the power source is switched on, power passes through the actuator interface, and an electrical potential across the actuator is altered, thereby causing the actuator to operate.

13. A movement facilitation device according to claim 12 additionally comprising a computer.

14. A movement facilitation device according to claim 13 wherein parameters of a software program on said computer allow for customising and selection of protocols to enable desired movements.

15. A movement device for facilitating movement of at least one joint of a patient's body, said device having:

(a) a support structure attached to at least a portion of the patient's body proximate the at least one joint, said support structure comprising at least a first member positioned so as not to interfere with an ability of the at least one joint to move; and

(b) at least one movement facilitation device having at least one actuator and at least one operating means, said actuator being coupled to the first member, and said operating means being coupled to the actuator for operating the actuator.

16. A movement device according to claim 15, wherein the support structure comprises at least one artificial joint or other movement means corresponding to each of the patient's joints which are intended to be moved by the device.

17. A movement device according to claim 16 wherein the operating means comprise a computer, whereby there is a corresponding electrical and/or computer data carrying channel for each movement facilitation device, said channel being capable of providing the necessary input to the movement facilitation device to which it corresponds for the operation of said movement facilitation device.

18. A movement device according to claim 17 wherein the operating means have controlling means for controlling a plurality of operating means, said controlling means having the capacity to receive information from one or more sensors and to use that information to control the operation of the operating means so as to achieve purposeful movement of the patient's joints.

19. A movement device for facilitating movement of at least one joint of a patient's body, said device having:

(a) a glove for enveloping at least a portion of the patient's body proximate the at least one joint;

(b) at least one movement facilitation device having at least one actuator, at least one operating means and at least one cable, said at least one cable forming a part of, or linked to, the glove, said actuator being capable of moving said

cable thereby causing movement of the joint in use, and said operating means being coupled to the actuator for operating the actuator.

20. Use of a movement device according to claim 15 to maintain and increase good condition of a person's hand and hand function following one or more events selected from the group consisting of spinal cord injury, burns, stroke, the onset of arthritis, septic arthritis, oedema, peripheral nerve injury and/or other syndromes influencing the condition and/or function of the upper extremity, including cerebral palsy, hand trauma and hand surgery.

21. Use of a movement device according to claim 19 to maintain and increase good condition of a person's hand and hand function following one or more events selected from the group consisting of spinal cord injury, burns, stroke, the onset of arthritis, septic arthritis, oedema, peripheral nerve injury and/or other syndromes influencing the condition and/or function of the upper extremity, including cerebral palsy, hand trauma and hand surgery.

22. A system for applying Continuous Passive Motion therapy to a hand of a patient, comprising:

a movement device according to claim 15;

a control system comprising a user interface and an internal CPU containing control software;

one or more force and position transducers connecting to the movement facilitation device; and

a power supply.

23. A system for applying Continuous Passive Motion therapy to a hand of a patient, comprising:

a movement device according to claim 19;

a control system comprising a user interface and an internal CPU containing control software;

one or more force and position transducers connecting to the movement facilitation device; and

a power supply.

24. A process for causing movement between a first portion of a first object and a second portion of the first object, said process comprising:

(a) providing a movement facilitation device according to claim 1; and

(b) operating the operating means, thereby causing the actuator to move the first portion relative to the second portion.

25. An actuator capable of incremental actuation comprising at least one movement control means in operational association with one or more actuation means, wherein said actuation means comprise a shape memory material or a conducting polymer, whereby displacement of a movement control means is promoted by change in dimension of the shape memory material or the conducting polymer.

26. A movement facilitation device according to claim 1 wherein the actuator is capable of incremental actuation, said actuator comprising at least one movement control means in operational association with one or more actuation means, wherein said actuation means comprise a shape memory material or a conducting polymer, whereby displacement of a movement control means is promoted by change in dimension of the shape memory material or the conducting polymer.

27. A transducer for determining an applied force comprising:

a radiation source and one or more detectors, and

a return mechanism coupled to the one or more detectors,

wherein each of the one or more detectors is capable of generating a signal dependent on an intensity of radiation incidental on said detector, and wherein a distance between the radiation source and a detector is a function of the force applied to the return mechanism.

28. A movement facilitation device according to claim 18 wherein the sensor comprises a transducer comprising:

a radiation source and one or more detectors, and

a return mechanism coupled to the one or more detectors,

wherein each of the one or more detectors is capable of generating a signal dependent on an intensity of radiation incidental on said detector, and wherein a distance

between the radiation source and a detector is a function of the force applied to the return mechanism.